



Energy Storage - SC Ex Parte Briefing

“Avoided Cost, Resource Planning and Energy Storage in an Era of Low-Cost Solar”

October 23rd, 2018

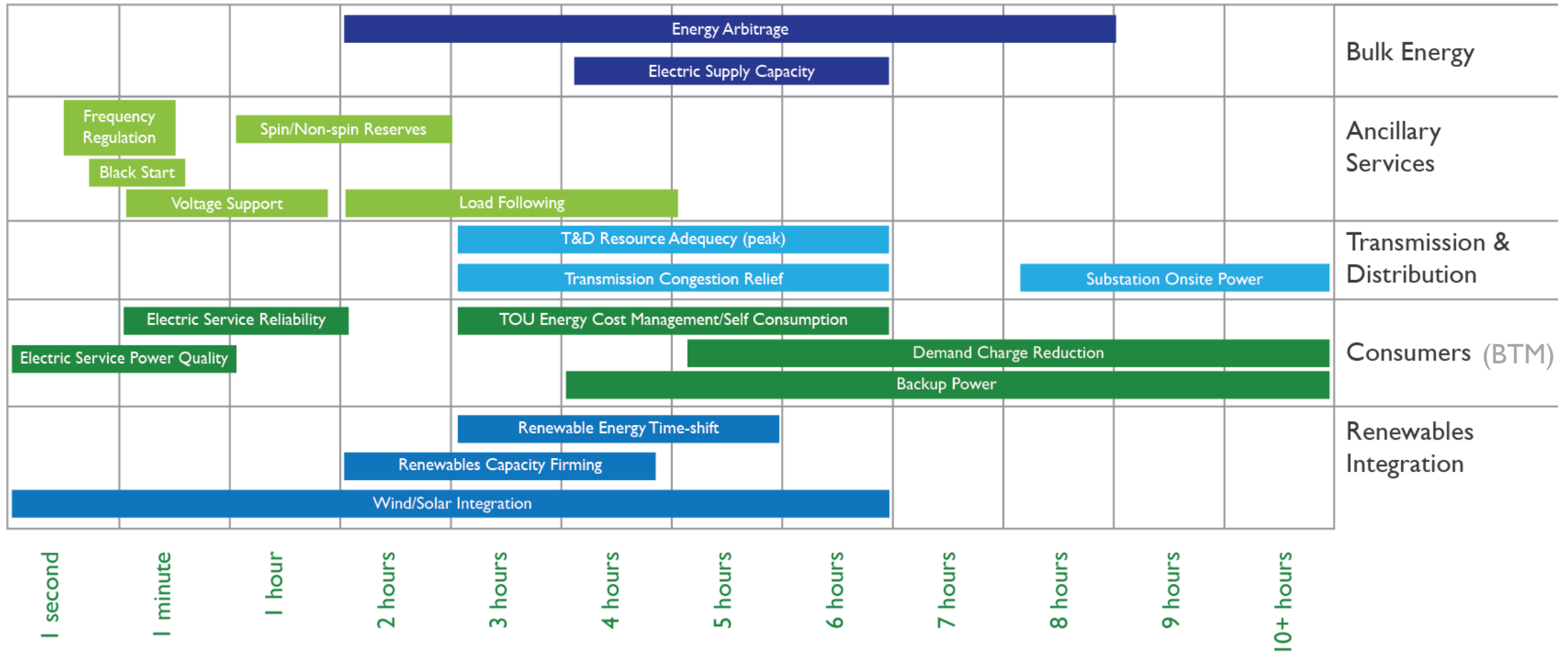
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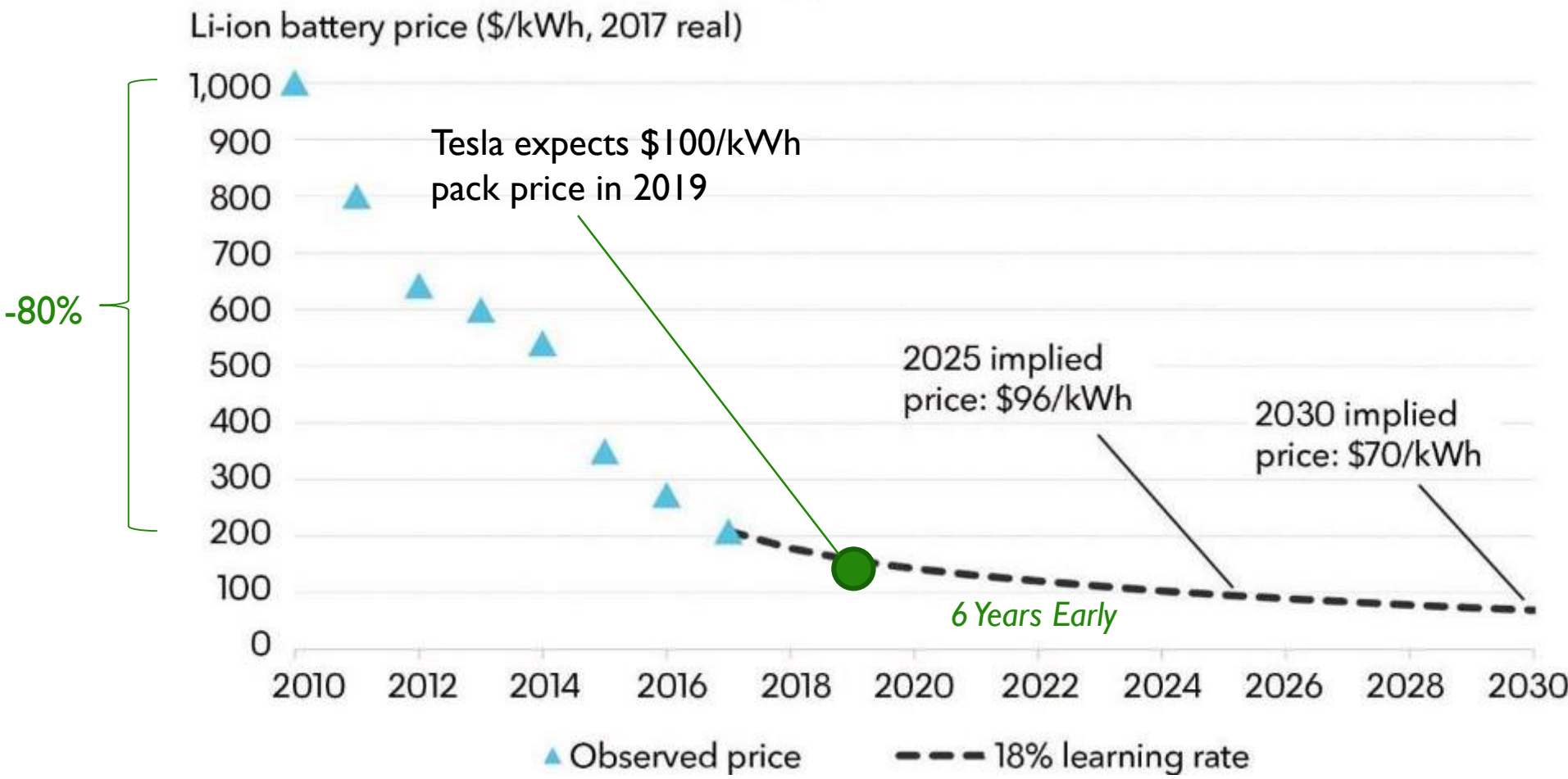
Known: Versatility of Storage

APPLICATIONS VS. DURATION



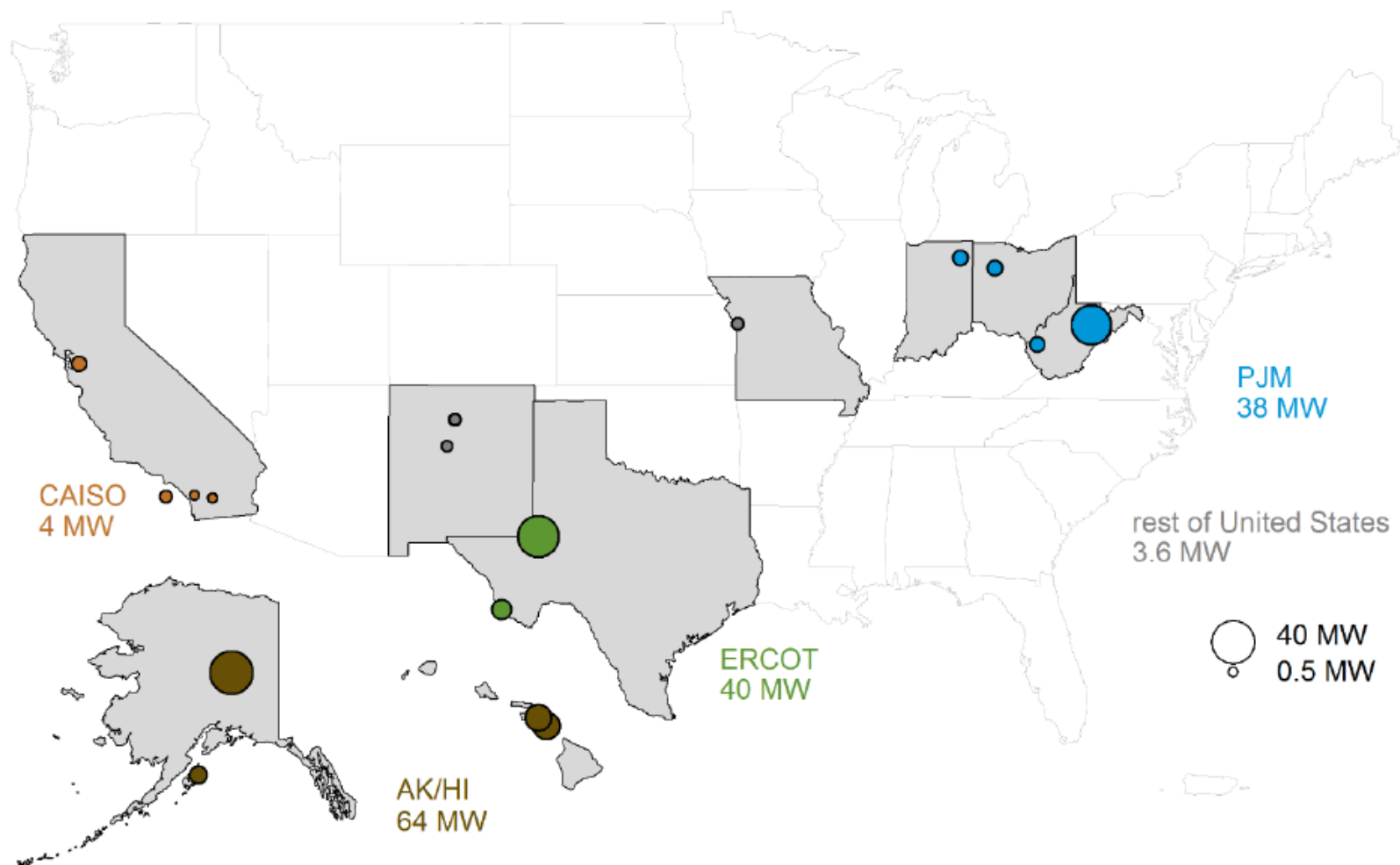
What's Changed: Battery Pricing

LITHIUM ION BATTERY CELL PRICES



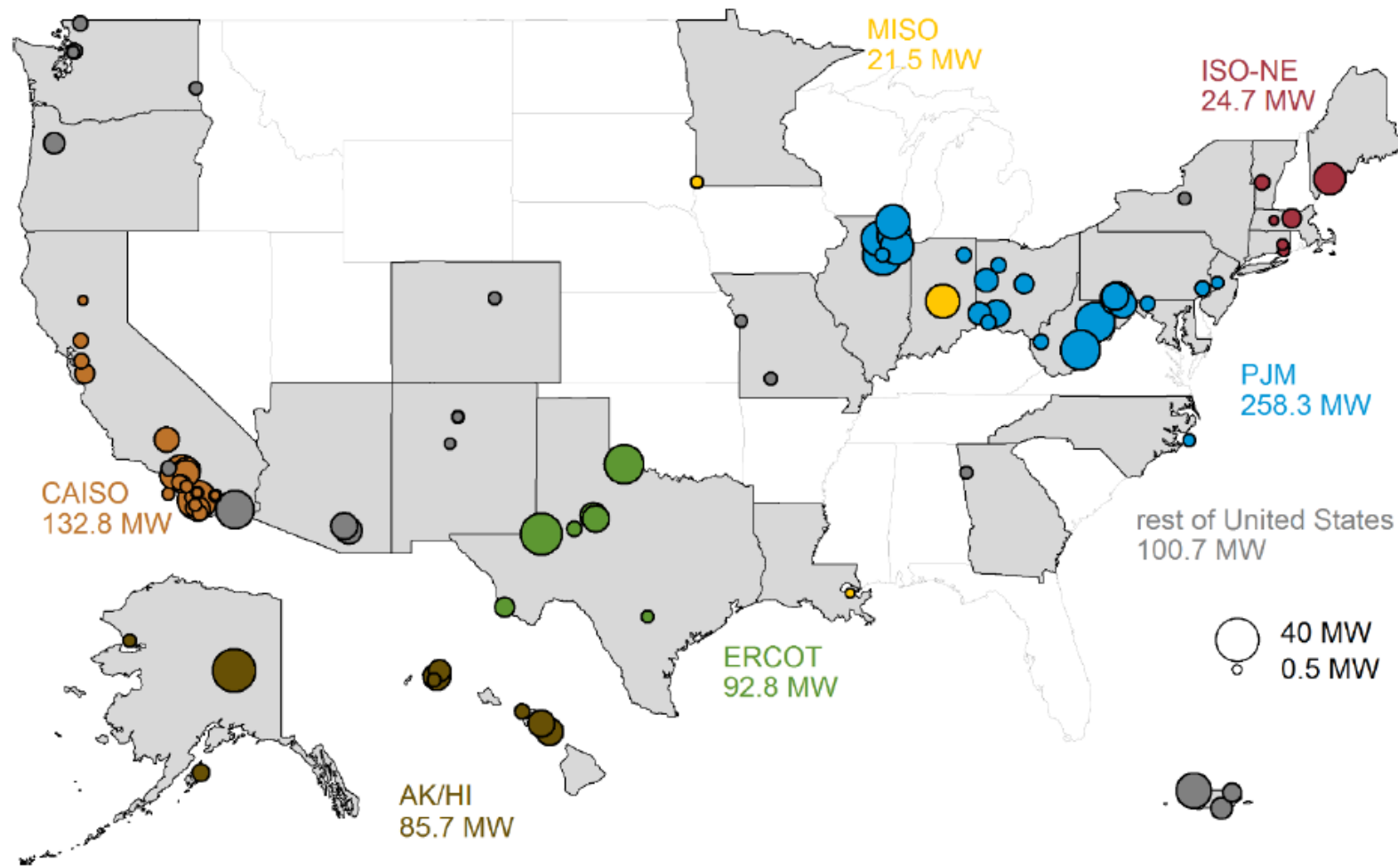
Energy Storage Deployment (Then)

US LARGE-SCALE BATTERY STORAGE CAPACITY BY REGION, 2012



Energy Storage Deployment (Now)

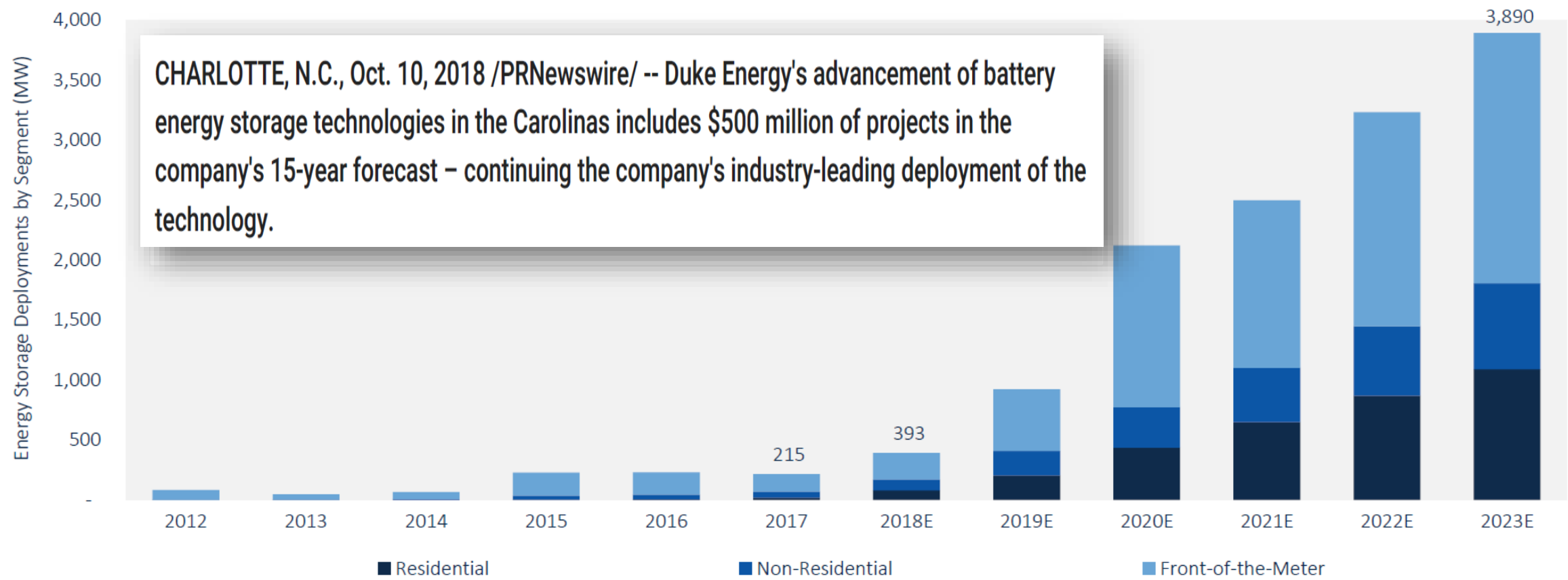
US LARGE-SCALE BATTERY STORAGE CAPACITY BY REGION, 2018



US Trends – Storage Power (MW)

ANNUAL INSTALLATION IN 2019 EXPECTED TO BE ~1 GW (5X 2016)

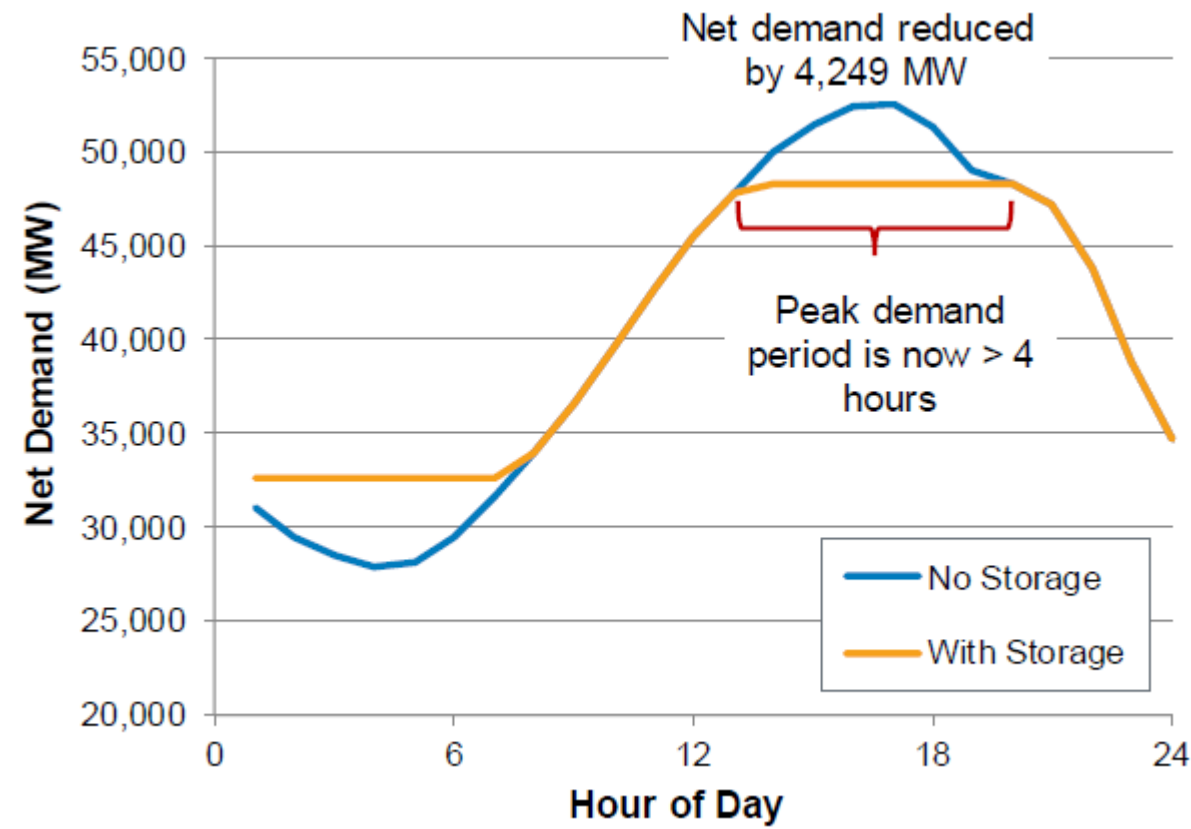
U.S. Annual Energy Storage Deployment Forecast, 2012-2023E (MW)



Time Shifting: Storage Reduces Peaks

IMPACT OF 4-HOUR STORAGE DISPATCH ON NET LOAD ON PEAK DEMAND DAY (2011)

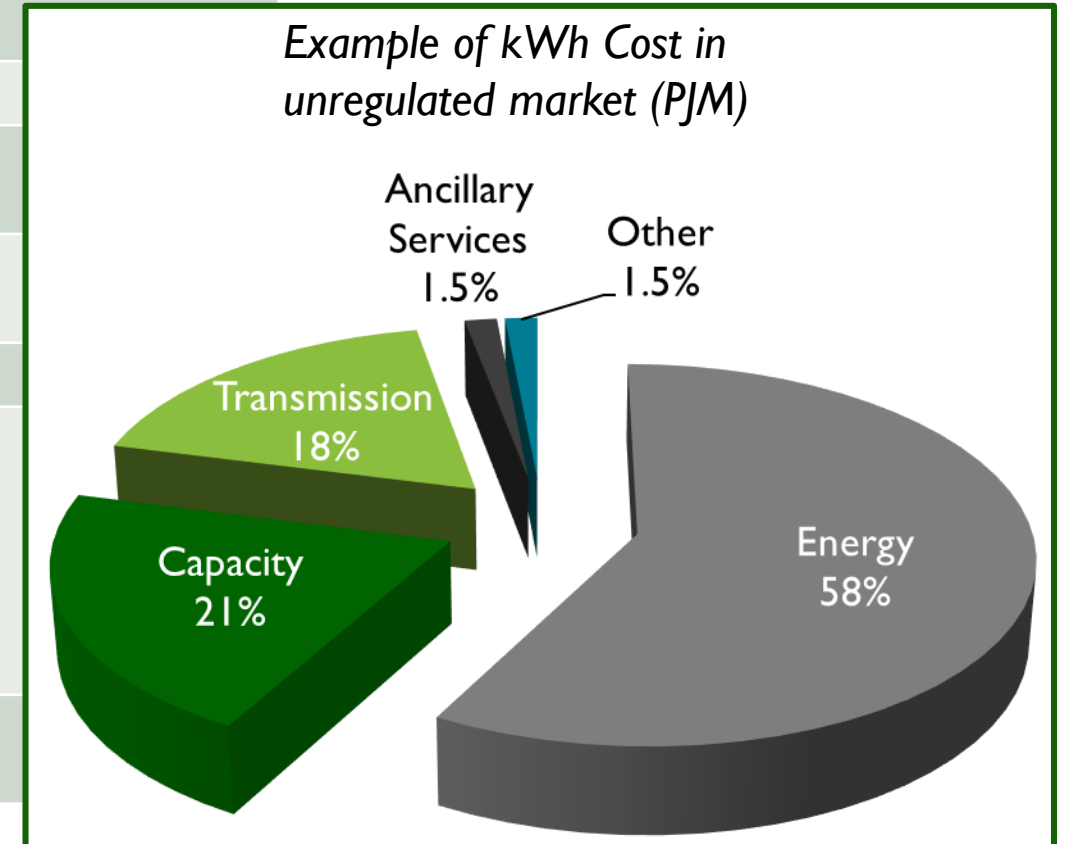
California system load
on peak demand day for
2011 (September 6th)



FTM Solar Plus Storage for South Carolina

STORAGE BENEFITS EXTEND ACROSS THE GRID

Benefit	Details
Capex Deferral – Peaker and T&D	<ul style="list-style-type: none"> Deferred Transmission and Distribution Capex Deferred Peak Generation Capex Deferred Ancillary Services Capex
Peak Generation	<ul style="list-style-type: none"> Reduced Peaker Operations
Power Interruptions	<ul style="list-style-type: none"> Black Start Outage Length Reduction
Power Quality	<ul style="list-style-type: none"> Reduced Momentary Outages, Reduced Sags and Swells
Air Emissions	<ul style="list-style-type: none"> Reduced CO₂, SO_x, NO_x, & PM-10 Emissions
Operations	<ul style="list-style-type: none"> Avoided Fuel Cost Reduced Congestion Costs and Line Losses Improve System-wide Heat Rate No Clipping/Lost kWhs Curtailed Option Demand Response
Other	<ul style="list-style-type: none"> Reduced Administrative Costs Avoided Fuel Price Uncertainty



**THANK YOU.
QUESTIONS?**